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CONDUCTOR ARRANGEMENT FOR USE WITH RADIO FREQUENCY APPARATUS

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Fig. 1

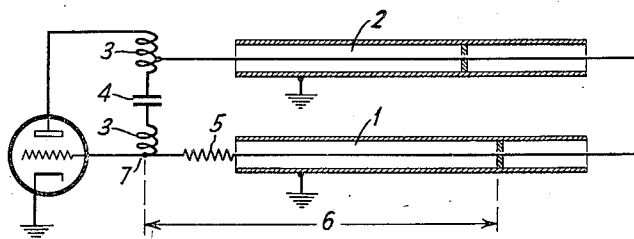


Fig. 2

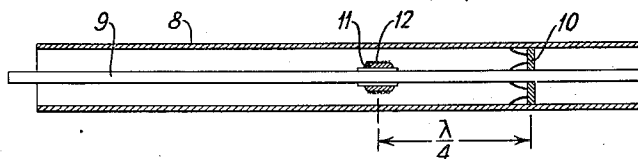
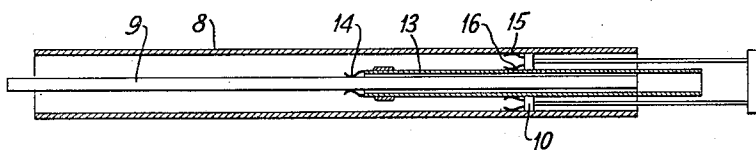


Fig. 3



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7 Claims. (Cl. 178—44)

In radio frequency arrangements, especially decimeter transmitters and receivers, the leads for direct current potentials, unless effected at points free from radio frequency as in push-pull transmitters, is often attended with serious difficulties. The choke coils used for the feeder leads must, from the electrical viewpoint represent lengths of roughly one-quarter wavelength, i. e., $\lambda/4$. Occasionally also straight line lengths, of variable length, are used; for instance, in the form of concentric or coaxial lines. Fig. 1, for instance, shows the arrangement of such supply leads in a self-excited triode type transmitter, these leads furnishing the grid direct current voltage (1) and the plate direct current potential (2).

Transmitter circuits of this kind exhibit a tendency to become excited at a longer wave than the short wave really selected and for which the inductance of the feed lines 1 and 2 conjointly with part of the inductance 3 of the oscillatory circuit and the isolating condenser 4 constitute the oscillation circuit. In order to prevent the occurrence of such stray waves, an ohmic resistance of suitable size may be provided in one of the lines as indicated; for instance, at 5. This, however, often occasions inadvertent damping also of the useful oscillatory circuit. In fact, such damping will arise only if the electrical length 6 of the feed line 1 is not spaced away from the end which is free from potential a distance exactly one-quarter of a wavelength ($\lambda/4$) and if the space occupied by the resistance element 5 is not very small compared with $\lambda/4$. Inasmuch as the supply leads should not affect the useful oscillation circuit, there must be satisfied the requirement that the electrical length from the branching or tap point of feeder line 7 to the end of this line free from potential; in other words, the length designated by 6 must be equal to $\lambda/4$ for the reason that the line viewed from the oscillation circuit will only then represent an infinitely high resistance for the radio frequency. However, these two requirements, particularly where decimeter waves are dealt with, cannot be reconciled with each other in most cases, for the reason that the distance from the terminal or tap point 7 to the center of the resistance element cannot be made negligibly small in technical constructions. In some circuit organizations, for instance in the case of oscillation circuits built into bulbs, point 7 often is not accessible at all. Another factor that proves annoying in this kind of damping of oscillations by an ohmic resistance

is that this supply line also produces direct current losses for which reason it might be used in the grid lead, but hardly in the anode lead whenever the plate currents are above the average.

5 An object of the present invention is an arrangement for direct current voltage supply which (1) may be tuned to maximum radio frequency resistance and which (2) exhibits for all waves, with the exception of the working wave, a high damping and in which (3) the direct current resistance is negligibly low.

10 In the drawing, Fig. 1 represents a known electron discharge device circuit arrangement, while Figs. 2 and 3 represent feed lines equipped in accordance with the principles of the invention.

15 To insure maximum radio frequency resistance, the total length of the supply leads must be an odd multiple of one-quarter wavelength, $\lambda/4$, (for instance, $\lambda/4$, $3\lambda/4$, etc.). For this purpose there is used a length of conductor 9 (see Fig. 2) placed inside a tube or pipe 8. The particular length of the conductor that is required is adjusted, as known in the art, by the short-circuiting slide or bridge piece 10 from the outside. The intended attenuation or damping for interfering waves or stray waves, but freedom from damping for the working waves is insured by a metallic bush or sleeve 11 adapted to be shifted along the inner conductor, said bush or sleeve having upon its outer face a coat 12 consisting of material of low conductance, that is to say, material of the kind known in the high-ohm art. The center of the bush is spaced $\lambda/4$ apart from the termination of the line; in other words, in a current node. What is here utilized is the phenomenon known as skin effect. According to this theory the depth of penetration of radio frequency waves would amount to only a few 10μ ; the result is that the radio frequency current must flow through the resistance coat rather than through the metallic core possessing high conducting powers. The direct current, on the contrary, for instance, the anode or plate current, flows through the metallic conductor and encounters no resistance. Resistances of the size mostly employed between 10 and 100 ohms are easily made of lengths of one centimeter. Hence, they can be mounted with great precision in the current node of the working wave in a circuit organization as here disclosed.

20 25 30 35 40 45 50 55 A commercial or technical embodiment of the invention is shown in Fig. 3. The shifting of the resistance element in this arrangement is feasible from the outside, this being accomplishable by seating it upon a tube piece 13 which, on the

one hand, slides upon the inner conductor 9, and, on the other hand, upon the short-circuit slider 10. Good contact is assured at points 14, 15, 16, by convenient spring means.

What is claimed is:

1. Supply or feed lead for radio frequency arrangements in the form of a concentric line, with the characteristic feature that upon the inner conductor in contact therewith, at a particular point, is shiftably arranged a cylindrical body with an outer coat of material of high resistance, said cylindrical body being insulantly spaced from the adjacent portion of the outer conductor of said line.

2. Supply or feed lead for radio frequency arrangements in the form of a concentric line with the characteristic feature that upon the inner conductor in contact therewith is shiftably arranged a cylindrical body with an outer coating of high resistance material, said cylindrical body being supported by a metallic tube which surrounds the inner conductor and makes electrical contact therewith, there being positioned upon this tube a short circuiting slider which slides in respect to the outer conductor of said line.

3. A coaxial line adapted to be traversed with radio frequency currents, comprising inner and outer conductors, means in contact with the inner conductor and the inner surface of the outer conductor and shiftable along a portion of the length of said line for tuning the same, and a high resistance sleeve located at a current node on said inner conductor and surrounding a small portion of said inner conductor, whereby the radio frequency current flowing over said inner conductor passes through said sleeve.

4. A coaxial line in accordance with claim 3, including means for changing the position of said sleeve over said inner conductor.

5. A coaxial line adapted to be traversed with radio frequency currents, comprising inner and outer conductors, and a high resistance sleeve located at a current node on said inner conductor and surrounding a small portion of said inner conductor, whereby the radio frequency current flowing over said inner conductor passes through said sleeve.

6. A coaxial line adapted to be traversed with radio frequency currents, comprising inner and outer conductors, means for tuning said line, and a high resistance sleeve located at a current nodal point on said inner conductor and surrounding a small portion of said inner conductor, whereby the radio frequency current flowing over said inner conductor passes through said sleeve.

7. A coaxial line adapted to be traversed with radio frequency currents, comprising inner and outer conductors, means in contact with the inner conductor and the inner surface of the outer conductor and shiftable along a portion of the length of said line for tuning the same, and a high resistance sleeve located at a current node on said inner conductor for the operating frequency and surrounding a small portion of said inner conductor, whereby the radio frequency current flowing over said inner conductor passes through said sleeve, the distance between said sleeve and said means being an odd multiple including unity of one-quarter the length of the communication wave.

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